Box 78

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Foundation / Soil / Geological Engineers

PALO ALTO / CALIFORNIA

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1971

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STANFORD VILLA / 3507 ALMA STREET / PALO ALTO / CALIFORNIA 94306

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415/328-6920

March 22, 1971
109-4, PA 2748

Mr. Edwin Ferguson
Santa Clara County Flood Control
and Water District
516 East Martha Street
San Jose, California 95112

Attention: Mr. Bruce Wilson

RE: INVESTIGATION OF BORROW MATERIAL SHRINKAGE
GUADALUPE CREEK IMPROVEMENT
SAN JOSE, CALIFORNIA

Dear Mr. Ferguson:

In accordance with your request we have performed a soil investigation to estimate the shrinkage of material to be borrowed from the Alamitos and Los Capitancillos percolation ponds for levees and other channel improvements on Guadalupe Creek from Blossom Hill Road to Hicks Road, San Jose, California. This letter contains only general information on our findings; for detailed results you are referred to the attached report.

Owing to operational difficulty of draining the percolation ponds, no direct in-place density tests could be taken over the invert of the ponds. Therefore, an indirect approach was used whereby eight rotary-wash exploratory borings were drilled along the pond alignment to determine the soil profile. In-place density tests were then taken in deep test pits adjacent to the ponds at four locations within the borrow area. The in-place values were determined for representative soils starting at a depth equivalent to the adjacent pond invert and extending to a maximum depth of 4 feet below the invert where generally the water table was found.

Based on the above work, silty and sandy gravel with cobbles will form the bulk of the material to be borrowed. After performing a statistical analysis of all values for in-place density obtained in the field, a present in-place density of 118.5 pounds per cubic foot is considered a representative value for all borrow material to be obtained from the percolation ponds. Comparison of this in-place density value with that obtained from laboratory compaction tests at 92 percent of the maximum dry density of 137.3 pounds per cubic foot, which we assume will represent the density achieved after placement and compaction, gives a shrinkage value of 6.4 percent. A review of all data indicates that the average shrinkage value would most likely be within 6 and 8 percent excluding haulage losses.

If you have any questions regarding the results of this investigation, please call us.

Very truly yours,

LOWNEY/KALDVEER ASSOCIATES

John V. Lowney

JVL:ph

Copies: Addressee (10)

TA7Ø5.3G8I61971

INVESTIGATION OF BORROW MATERIAL

For
GUADALUPE CREEK IMPROVEMENT
SAN JOSE, CALIFORNIA

To
SANTA CLARA COUNTY FLOOD CONTROL
AND WATER DISTRICT
516 East Martha Street
San Jose, California

March 1971

SANTA CLARA VALLEY WATER DISTRICT
LIBRARY
5750 ALMADEN EXPRESSWAY
SAN JOSE, CALIFORNIA 95118

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INVESTIGATION OF BORROW MATERIAL

GUADALUPE CREEK IMPROVEMENT
SAN JOSE, CALIFORNIA

INTRODUCTION

In this report we present the results of a soil investigation to evaluate the shrink/swell properties of material to be borrowed from beneath percolation ponds along a reach of Guadalupe Creek from Blossom Hill Road to Hicks Road in San Jose, California. Borrow material will be used to construct levees for the improvement of 3 miles of channel. It is our understanding that the shrinkage properties of the material are required in estimating earthwork quantities and costs for approximately 200,000 to 300,000 cubic yards of material. The borrow areas were selected by the District.

This investigation was conducted for two purposes: (1) to determine a representative soil profile down through the borrow areas, and (2) to determine the shrink-swell properties of the borrow material.

SCOPE

The scope of work performed for this investigation included a reconnaissance of the borrow areas, subsurface exploration, in-place density determinations, laboratory testing, analyses of the field and laboratory data and the preparation of this report.

The conventional method of determining shrinkage by in-place density tests in backhoe test pits over the invert of ponds could not be used due to operational inability to drain the facilities during the winter months. Therefore, indirect methods of sampling and testing representative material adjacent to the ponds were used in this investigation. Investigation of the existing channel or material to be excavated from the channel and used as fill is outside the scope of our services.

INVESTIGATION

A 1.5-mile reach of the borrow area adjacent to the channel alignment was investigated from Blossom Hill Road to near Hicks Road. The borrow area includes most of the area of the Alamitos and Los Capitancillos percolation ponds along Guadalupe Creek. A subsurface investigation was performed on February 25 and 26, 1971 using a rotary wash drill rig to evaluate and sample the subsurface soils. A total of eight exploratory borings were drilled to a maximum depth of 20 feet. The locations of the borings are shown on the Generalized Soil Profile, Figures 1 through 4; the logs of the borings are included in Appendix A.

Upon completion of the drilling program, four test pits were excavated at the edge of the pond areas using the District's Gradall. These pits were excavated to a maximum depth of 13 feet at the locations shown on Figures 1 through 4, for the purpose of securing in-place density tests of soil at depths near or below the invert of the adjacent ponds. The test data obtained from this program are contained in Table B-1," Shrinkage Determination".

A. Surface

The borrow areas investigated are occupied by 12 percolation ponds and related facilities, access roads [illegible] connecting pipelines or ditches. The ponds, which average 300 by 500 feet in plan, [illegible] clustered in groups of three and generally vary from 9 to 14 feet in depth. Natural soil forms the north bank of the ponds upstream of Almaden Expressway bridge, and some original growth of scattered sycamore trees is preserved in this area. All other embankments are constructed of fill excavated from the channel and pond areas along with minor exposures of natural soil. Very little surface cover vegetation is present in these areas.

B. Subsurface

As determined from the borings, the subsurface soil profile through the alignment investigated is shown on Figures 1 through 4. Variable dense to very dense silty gravel with cobbles and minor amounts of clay is predominant to depths of at least 20 feet in the lower reach of the pond areas (Borings 5 through 8). This silty gravel overlies very dense clayey gravel from depths of 15 to 17 feet in the upper reach of the ponds (Borings 2 through 4). The clayey gravel is probably present below Boring 1 which was taken to a depth of only 15 feet, due to extreme caving conditions even with the use of drilling muds. The upper gravels represent fill and relatively recent stream deposits whereas the clayey gravel represents older alluvium. The contact between the two deposits is irregular. As evidenced by exploratory drilling, the contact is marked by very coarse gravel and cobbles apparently resting on the older deposits.

Because the rotary wash method was used to advance the borings, natural water levels were difficult to determine. Where noted, groundwater levels generally coincide with the current surface water elevations in the adjoining ponds.

The analysis and recommendations contained in this report are based upon the data obtained from the eight exploratory borings performed at the locations indicated on Figures 1 through 4. This report does not reflect any variations which may occur between these borings. The nature and extent of variations between the borings may not become evident until course of construction.

EVALUATION AND RECOMMENDATIONS

Although this determination of shrinkage is not as direct as if it were based on in-place densities taken in the invert of the percolation ponds, in our opinion shrinkage values contained in this report are representative.

A. BORROW MATERIAL DISTRIBUTION

The soil profile on Figures 1 through 4 shows the general distribution of the three main types of gravel and indicates the relation of these units to the pond invert elevation. Based on this relationship, deeper excavation for borrow within the Alamitos Ponds and the downstream portion of the Los Capitancillas Ponds will involve mostly the silty gravel unit. Beginning with Boring 4 in the upstream end of the ponds, somewhat clayey gravel locally will be excavated from about 3 to 5 feet below the invert downward. Although the nature of the gravel changes slightly, the overall differences in density between the two types of gravel are not great; no significant difference in the shrinkage factor between the two types of material is expected based upon our work.

B. SHRINKAGE DETERMINATION

1. Definition

Compacted soils generally occupy less volume (weigh more) than the undisturbed material from which they were borrowed. Shrinkage, representing the difference in volume between the pit and fill, is defined as:

$$\text{Shrinkage (\%)} = \left(1 - \frac{\text{Fill Volume}}{\text{Borrow Volume}}\right) \times 100$$

2. Field

Exploratory borings were completed over the ponds to be used for borrow to gain some insight into the type and distribution of soils underneath the actual area to be excavated in the nearby ponds. Since it was impossible to secure in-place densities below the invert of the ponds due to the water level, four test pits for this purpose were excavated at the edge of the ponds (Figures 1 through 4). In-place density tests were taken at 1-to 2-foot intervals starting at a depth equivalent to the invert of the adjacent pond. These tests were taken to a depth as much as 4 feet below the invert where usually the water table was encountered. As shown on Table B-1, a total of 16 in-place density tests were taken or four tests per pit.

Owing to the very coarse nature of the gravel which locally contained pockets of large cobbles, it was necessary to excavate a large sample in some cases (1 to 2 cubic feet), line the resulting hole with a thin plastic membrane, and calculate the volume of the hole using water. The results of both these large scale tests and the conventional small scale tests using the sand cone method were compared by statistical evaluation in calculating the shrinkage values. Larger volume density tests holes are necessary when evaluating very coarse cobbly or bouldery material.

3. Laboratory

The in-place densities were compared with the results of laboratory compaction tests to determine the shrinkage at that location. The laboratory tests (California Test Method 216) were performed on representative samples of material taken from the test pits.

Laboratory tests indicated a maximum density of 137.3 pounds per cubic foot for sandy gravel which will form the bulk of the material to be borrowed. A value of 142.4 pounds per cubic foot was obtained for some material from Test Pit 4 (Table B-2) but this is representative of only a small fraction of the material to be excavated in the upper part of the alignment.

4. Analysis

Three series of in-place density tests have been analysed: (1) large scale tests only, (2) small scale tests only and, (3) all tests lumped together. A summary is presented below in Table 1.

TABLE 1, STATISTICAL ANALYSIS OF FIELD DENSITY TESTS

Designation	Mean Dry Unit Weight (pcf)	Standard Deviation	Reliability (%)
1. Large Scale Tests	117.1	10.08	91.4
2. Small Scale Tests	119.3	7.25	93.9
3. All Tests	118.5	8.15	93.1

Reliability as presented in the above table is a relative term only. For our analyses we have chosen to define reliability as a measure of the ratio between the standard deviation and the mean. This is a reasonable definition since the lower this ratio, the more reliable the mean.

An examination of the above values indicates that the tests are almost equally reliable. It is unlikely that the small scale tests are more reliable than the large scale tests but the figures obtained do, to a very large extent, represent the number of samples evaluated (in this case the number of tests performed); hence, the greater reliability obtained for the small scale tests. In any event, the above figures demonstrate that a density between 115 and 120 pounds per cubic foot can be considered representative of any test that may be taken in the borrow material anywhere over the borrow area.

On the basis of the field test results, the choice of any of the above three mean unit weights would be reasonable as a representative value. However, since a larger sample of test data will always give better results, we recommend the use of an in-place density of 118.5 pounds per cubic foot obtained by lumping all tests together as representative for the borrow materials evaluated.

5. Results

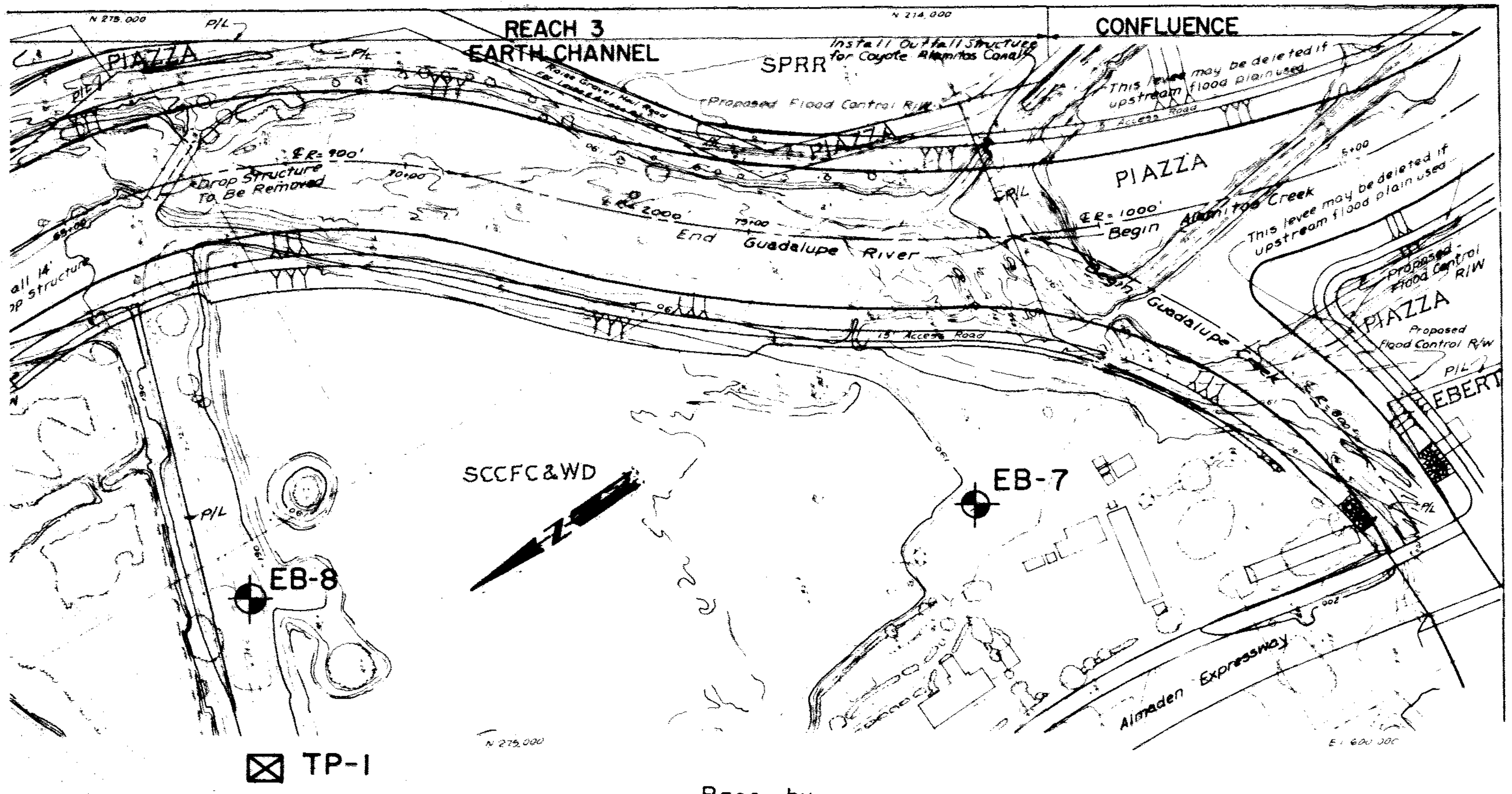
It would not be possible to estimate shrinkage without knowing what actual percent compaction will be achieved in the field. A review was, therefore, made of previously performed density tests in similar materials. It was determined that the average of all passing tests in gravelly materials is approximately 92 percent of maximum laboratory dry density. This value was used in our shrinkage evaluation.

Based on the achievement of the above field compaction and a present in-place dry density of 118.5 pounds per cubic foot, a shrinkage factor of 6.4 percent was determined. After a review of all the data included on Table B-1 and based upon the 16 field density tests, the shrink/swell ranges from a maximum of 22.5 percent shrinkage to a minimum of 3.8 percent swell. In our opinion, the average shrinkage factor would most likely be between 6 and 8 percent on a mass volume basis excluding any hauling losses. Such hauling losses should be estimated by the District based upon their previous experience on channel earthwork projects.

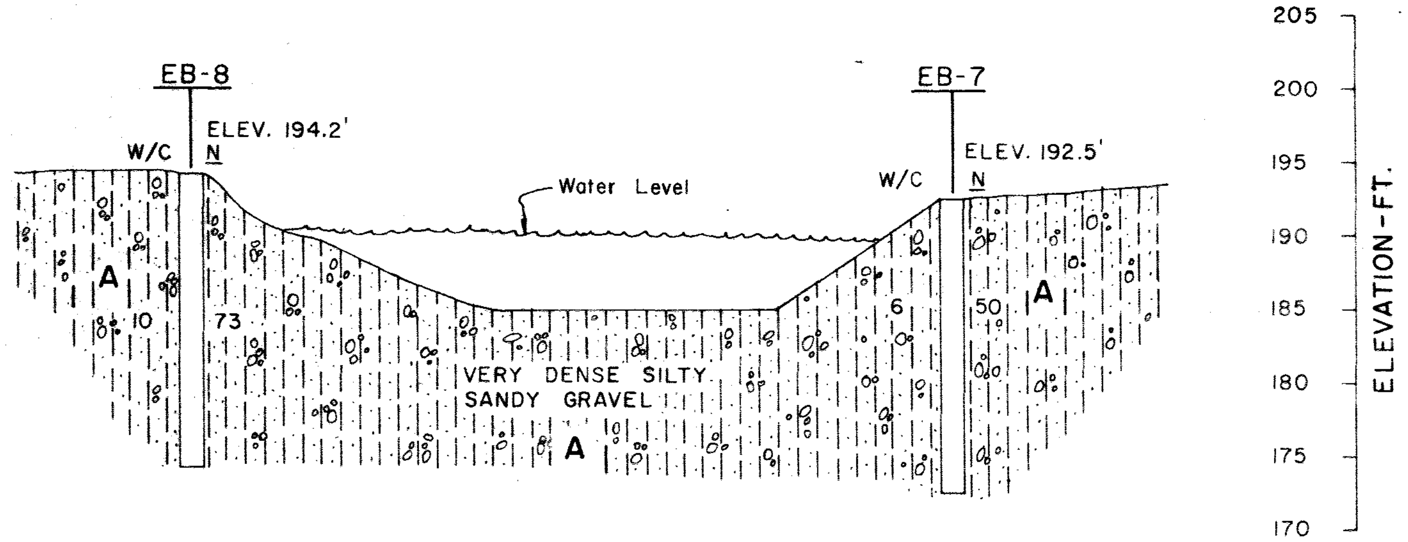
LIMITATIONS

This firm has prepared this report in accordance with generally accepted soil and foundation engineering practices and makes no other warranties either expressed or implied as to the professional advice provided in this report.

This firm is responsible for the conclusions and opinions contained in this report based on the data relating only to the specific project and location discussed herein. In the event conclusions or recommendations based on these data are made by others, such conclusions or recommendations are not the responsibility of this firm unless we have been given an opportunity to review and concur on such conclusions or recommendations in writing.


REACH 3
EARTH CHANNEL
CONFLUENCE
PIAZZA
SPRR
Install Outfall Structure for Coyote Alamitos Canal
Proposed Flood Control R/W
This levee may be deleted if upstream flood plain used
Drop Structure To Be Removed
End Guadalupe River
Begin Alamitos Creek
Guadalupe Creek
Access Road
Proposed Flood Control R/W
EBERT
SCCFC&WD
N
EB-7
EB-8
P/L
Almaden Expressway
TP-1

Base by
Santa Clara County Flood Control & Water District
March 1965



LEGEND

☒	TP-1	TEST PIT LOCATIONS
⊕	EB-1	EXPLORATORY BORING LOCATIONS
	W/C	WATER CONTENT - %
	N	STANDARD PENETRATION RESISTANCE BLOWS/ft
▨	A	SILTY SANDY GRAVEL
▨	B	SILTY GRAVEL WITH CLAY
▨	C	CLAYEY GRAVEL

SCALE:

VERTICAL 1"=12'
HORIZONTAL 1"=250'

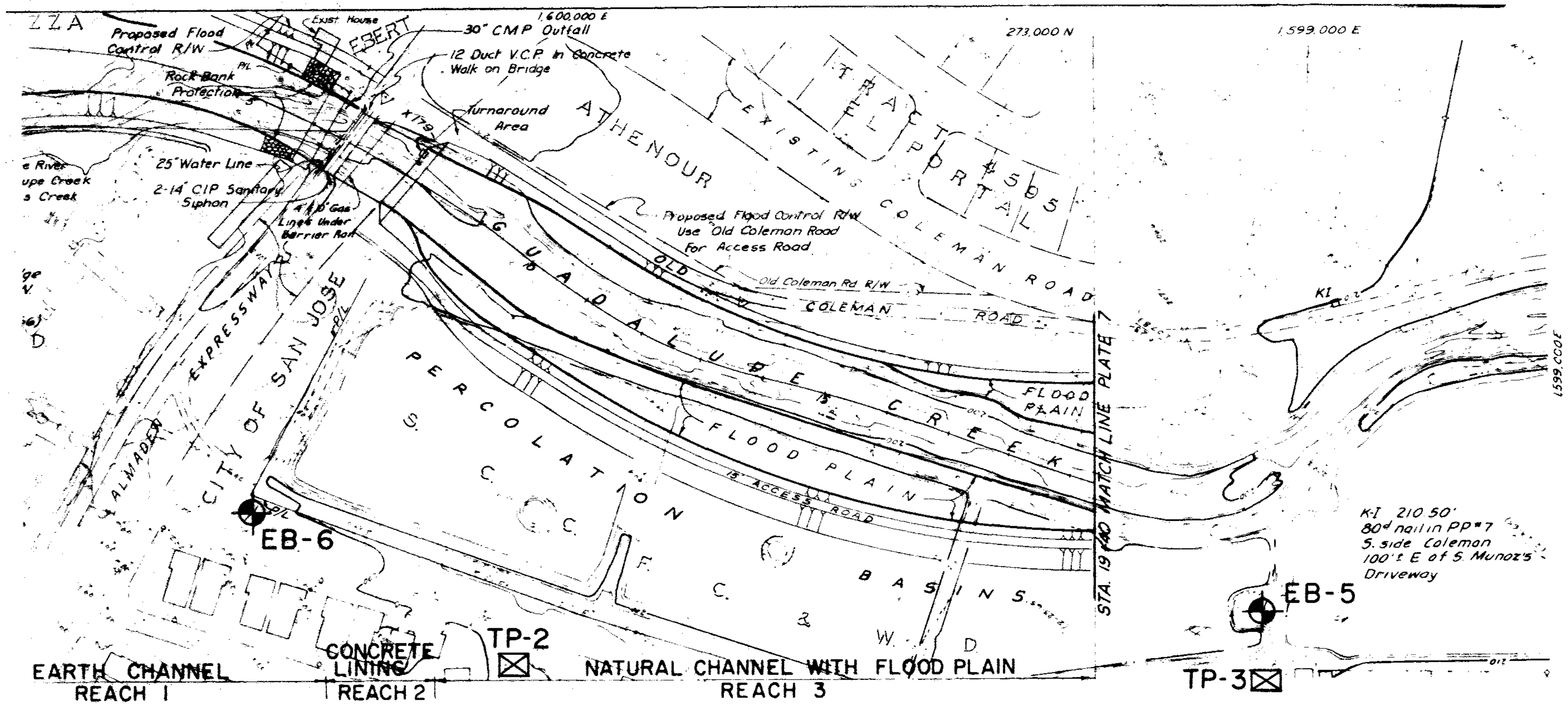
LOWNEY & KALDVEER
Foundation/Soil/Geological Engineers

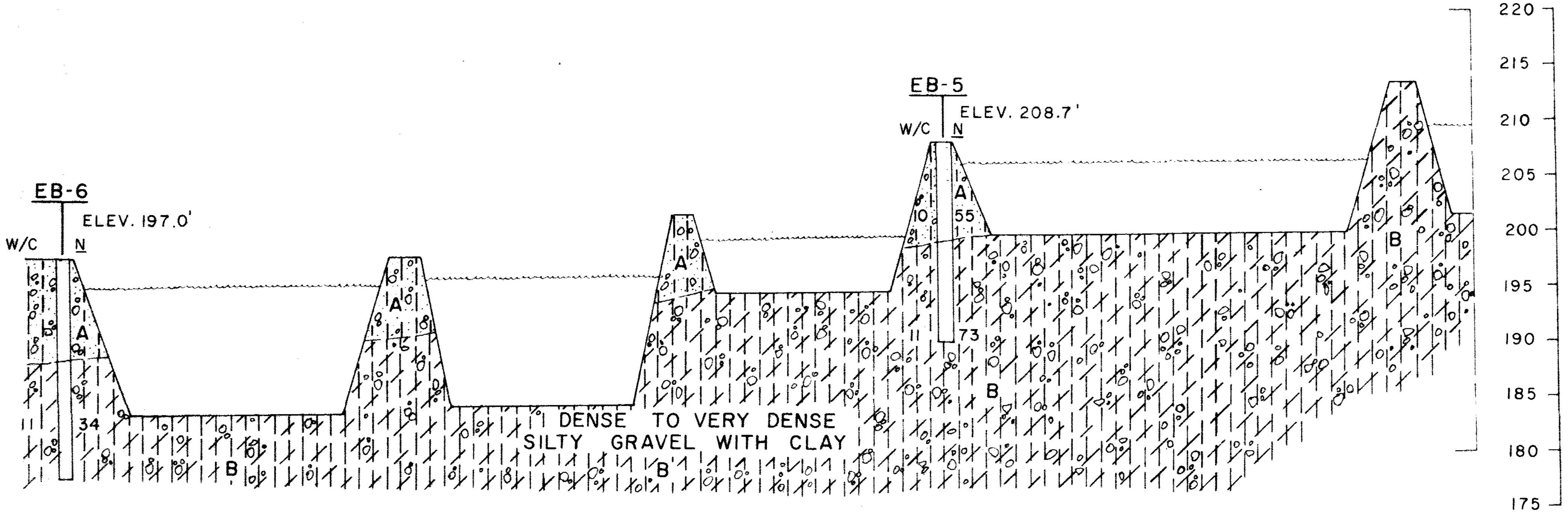
PALO ALTO, CALIFORNIA

GENERALIZED SOIL PROFILE

GUADALUPE CREEK
SAN JOSE, CALIFORNIA

PROJECT NO	DATE	DRAWING NO
109-4	MARCH 1971	FIGURE NO. 1





LEGEND

SEE FIGURE NO. 1

SCALE:

VERTICAL 1"=12'

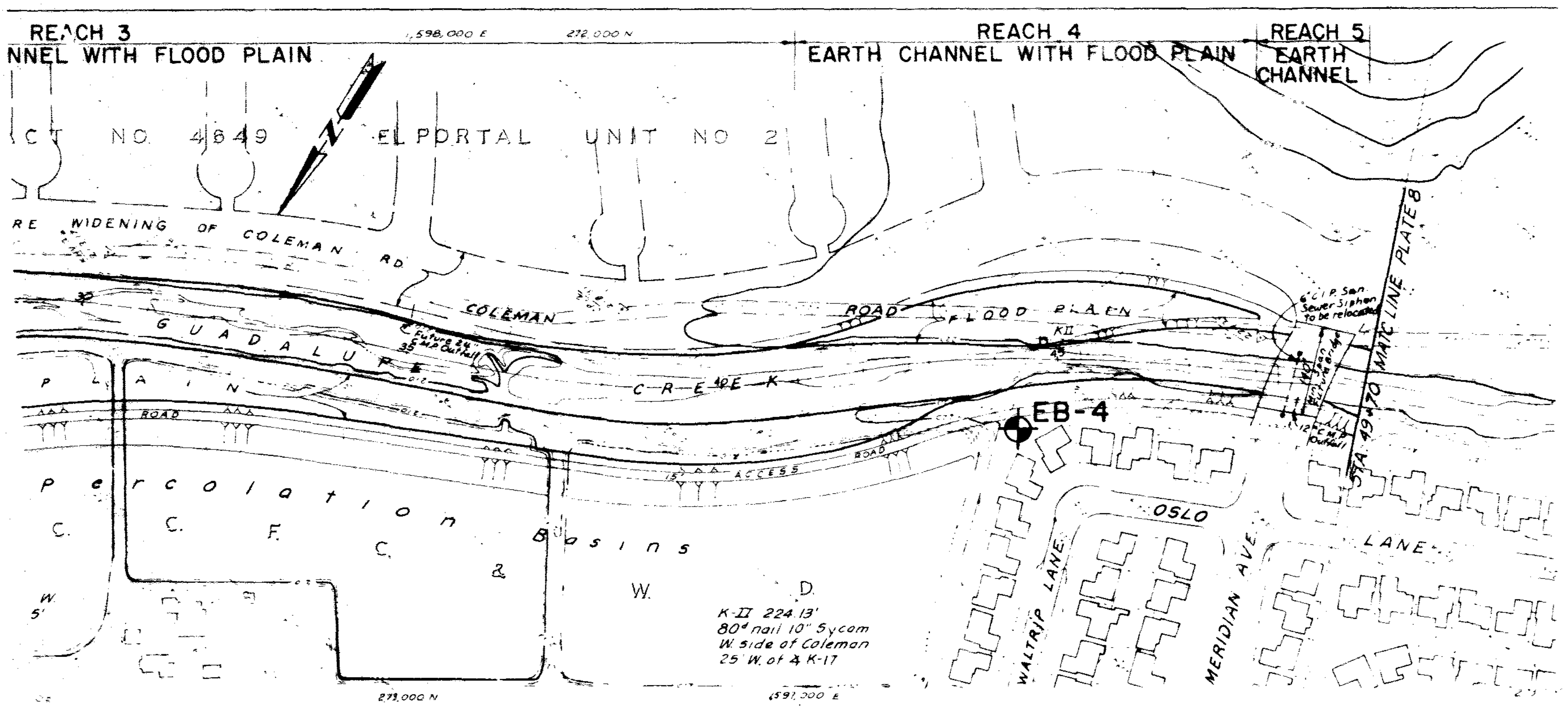
HORIZONTAL 1"=250'

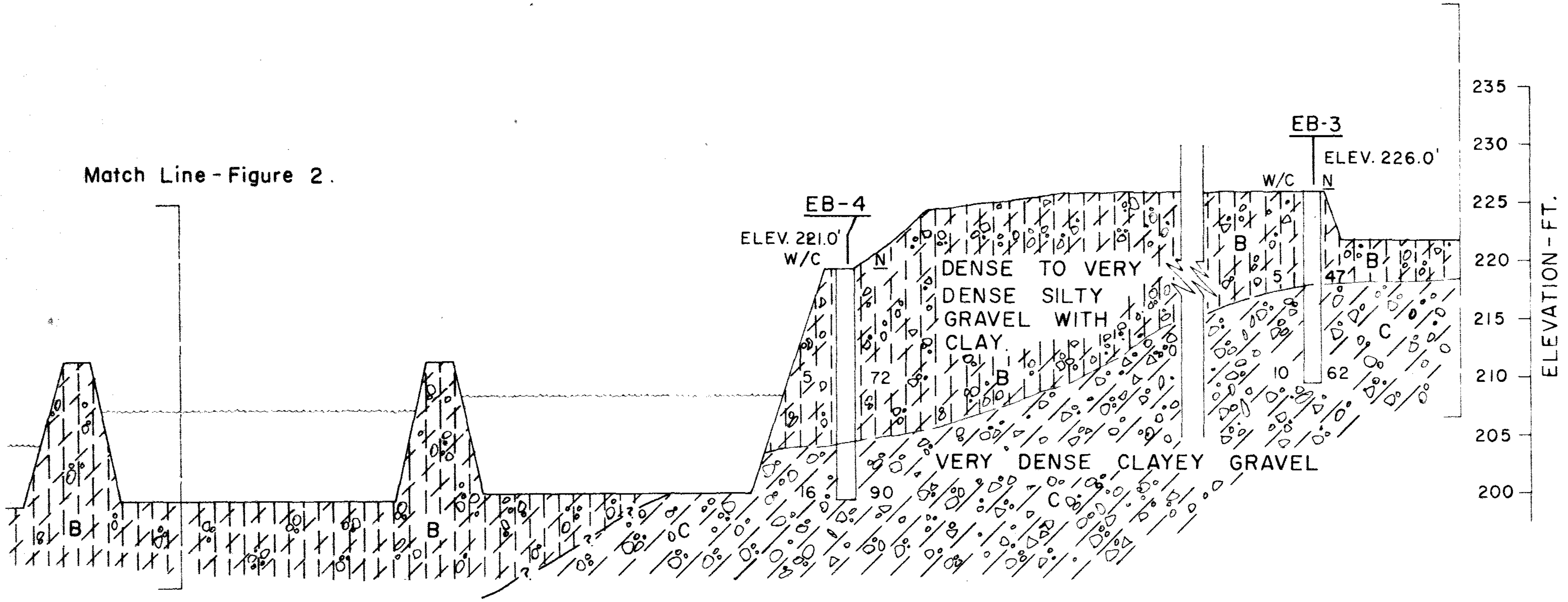
LOWNEY & KALDVEER
Foundation/Soil/Geological Engineers
PALO ALTO, CALIFORNIA

GENERALIZED SOIL PROFILE

GUADALUPE CREEK
SAN JOSE, CALIFORNIA

PROJECT NO	DATE	DRAWING NO
109-4	MARCH 1971	FIGURE NO. 2





LEGEND

SEE FIGURE NO. 1

SCALE:

VERTICAL 1" = 12'
HORIZONTAL 1" = 250'

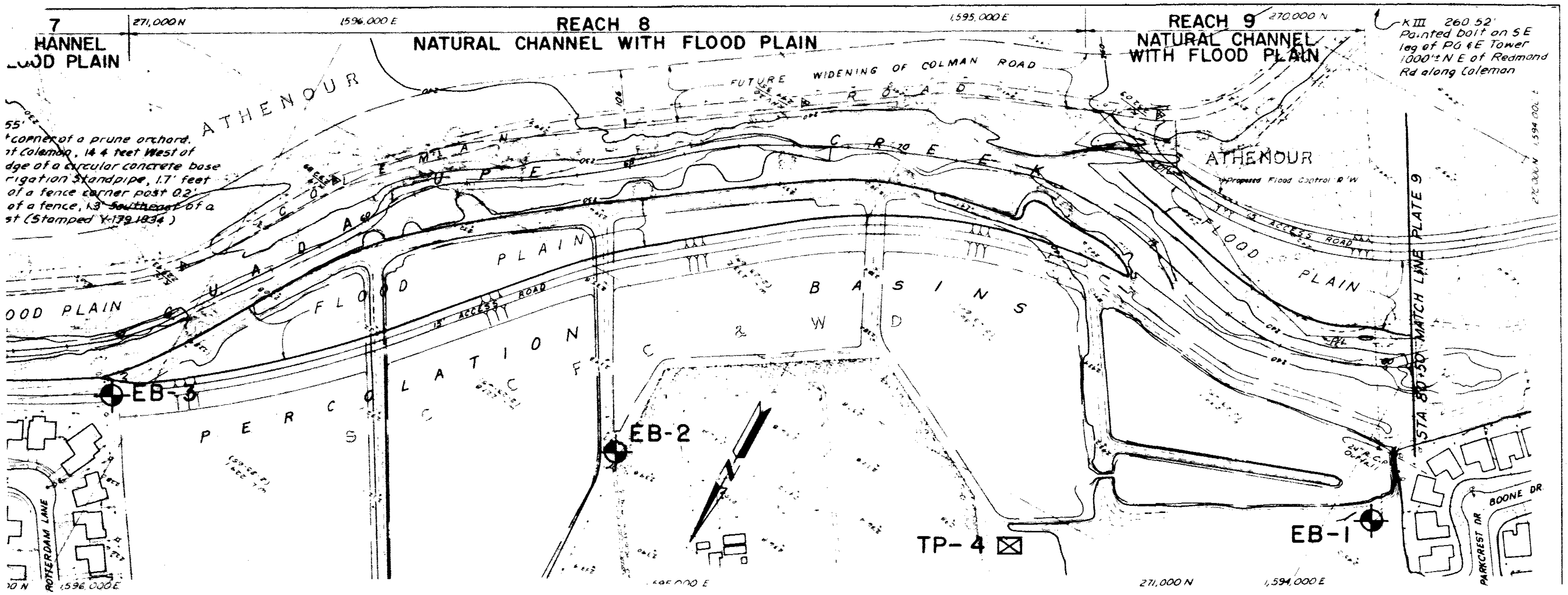
LOWNEY & KALDVEER
Foundation/Soil/Geological Engineers

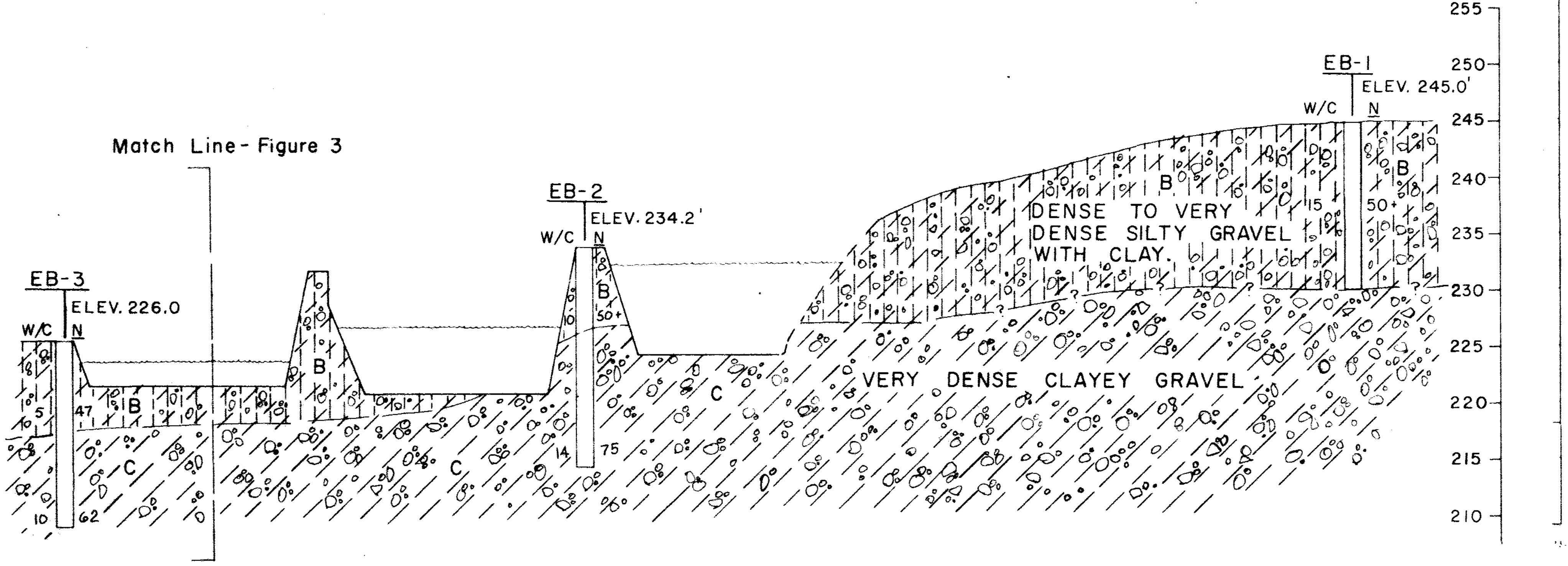
PALO ALTO, CALIFORNIA

GENERALIZED SOIL PROFILE

GUADALUPE CREEK
SAN JOSE, CALIFORNIA

PROJECT NO	DATE	DRAWING NO
109-4	MARCH 1971	FIGURE NO. 3


7
HANNEL
OOD PLAIN
271,000 N
1596,000 E
REACH 8
NATURAL CHANNEL WITH FLOOD PLAIN
1,595,000 E
REACH 9
270,000 N
NATURAL CHANNEL WITH FLOOD PLAIN
K III 260.52'
Painted bolt on SE leg of PG & E Tower 1000'± N E of Redmond Rd along Coleman
55'
corner of a prune orchard.
at Coleman, 14.4 feet West of
dge of a circular concrete base
rigation Standpipe, 1.7' feet
of a fence corner post 0.2'
of a fence, 1.3' Southeast of a
st (Stamped Y-179 1834)
ATHENOUR
FUTURE WIDENING OF COLMAN ROAD
R O A D
C R E E K
G U A D A L U P E
FLOOD PLAIN
15' ACCESS ROAD
P E R C O L A T I O N
B A S I N S
S C C F C & W D
ATHENOUR
Proposed Flood Control R/W
FLOOD PLAIN
STA 80+50 MATCH LINE PLATE 9
270,000 N
1,594,000 E
EB-3
EB-2
TP-4
EB-1
BOONE DR
PARKCREST DR
POTTERDAM LANE
1596,000 E
271,000 N
1,594,000 E



LEGEND

SEE FIGURE NO. 1

SCALE:

VERTICAL 1" = 12'

HORIZONTAL 1" = 250'

LOWNEY & KALDVEER
Foundation/Soil/Geological Engineers

PALO ALTO, CALIFORNIA

GENERALIZED SOIL PROFILE

GUADALUPE CREEK

SAN JOSE, CALIFORNIA

PROJECT NO.	DATE	DRAWING NO
109-4	MARCH 1971	FIGURE NO. 4

APPENDIX A - FIELD INVESTIGATION

The field investigation consisted of a surface reconnaissance and a subsurface exploration program using a truck-mounted rotary wash drill rig. A total of eight 6-inch diameter exploratory borings were drilled on February 25 and 26, 1971 to a maximum depth of 20 feet at the site. The locations of the exploratory borings are shown on Figures 1 through 4. The soils encountered in the borings were continuously logged in the field by our representative and described in accordance with the Unified Soil Classification System (ASTM D-2487). The logs of the borings as well as a key for the classification of the soil are included as part of this appendix.

Representative soil samples were obtained from the exploratory borings at selected depths appropriate to the soil investigation. All samples were transmitted to our laboratory for evaluation and appropriate testing.

The standard penetration resistance blow counts were obtained by dropping a 140-pound hammer through a 30-inch free fall. The 2-inch O.D. split spoon sampler was driven 12 to 18 inches and the number of blows recorded for each 6-inch penetration. The blows per foot recorded on the boring log represent the accumulated number of blows that were required to drive the final 6-inch penetration intervals.

In addition to the exploratory drilling program, four test pits were excavated with a Gradall to a total depth of 13 feet at locations shown on Figures 1 through 4. These excavations were made to secure in-place density tests as reported on Table B-1.

The boring logs show our interpretation of the subsurface conditions at the dates and locations indicated, and it is not warranted that they are representative of subsurface conditions at other locations and times.

PRIMARY DIVISIONS				GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIALS IS LARGER THAN #200 SIEVE SIEZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN #4 SIEVE		CLEAN GRAVELS (LESS THAN 5% FINES)	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES.
				GP	POORLY GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES.
			GRAVEL WITH FINES	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURE. NON-PLASTIC FINES.
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES. PLASTIC FINES.
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN #4 SIEVE		CLEAN SANDS (LESS THAN 5% FINES)	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES.
				SP	POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES.
			SANDS WITH FINES	SM	SILTY SANDS, SAND-SILT MIXTURES. NON-PLASTIC FINES.
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES. PLASTIC FINES.
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN #200 SIEVE SIZE	SILTS & CLAYS		LIQUID LIMIT IS LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY.
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS.
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY.
	SILTS & CLAYS		LIQUID LIMIT IS GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS.
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS.
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS.
	HIGHLY ORGANIC SOILS			PT	PEAT AND OTHER HIGHLY ORGANIC SOILS.

DEFINITION OF TERMS

GRAIN SIZES

U.S. STANDARD SERIES SIEVE — CLEAR SQUARE SIEVE OPENINGS

	200	50	16	4	3/4"	3"	6"
SILTS & CLAYS DISTINGUISHED ON BASIS OF PLASTICITY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

MOISTURE CONDITION (INCREASING MOISTURE ⟶)

DRY	SLIGHTLY DAMP	DAMP		MOIST	VERY MOIST	WET (SATURATED)
			(PL)			(LL)

CONSISTENCY			RELATIVE DENSITY	
CLAYS & SILTS	BLOWS/FOOT*	STRENGTH‡	SANDS & GRAVELS	BLOWS/FOOT*
Very Soft	0 - 2	0 - 1/4	Very Loose	0 - 4
Soft	2 - 4	1/4 - 1/2	Loose	4 - 10
Firm	4 - 8	1/2 - 1	Medium Dense	10 - 30
Stiff	8 - 16	1 - 2		
Very Stiff	16 - 32	2 - 4	Dense	30 - 50
Hard	Over 32	Over 4	Very Dense	Over 50

* Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D. (1-3/8 inch I.D.) split spoon (ASTM D-1586).

‡ Unconfined compressive strength in tons/sq ft. Read from a pocket penetrometer.

LOWNEY & KALDVEER
Foundation/Soil/Geological Engineers

PALO ALTO, CALIFORNIA

KEY TO SOIL BORING LOGS
Unified Soil Classification System ASTM D-2487

GUADALUPE CREEK
San Jose, California

PROJECT NO.	DATE	DRAWING NO.
109-4	March 1971	---

DRILL RIG Rotary Wash	BORING ELEVATION ---	LOGGED BY J. C. W.	
DEPTH TO GROUNDWATER Not Determined	BORING DIAMETER 6 Inches	DATE DRILLED 2/26/71	

DESCRIPTION AND CLASSIFICATION: DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH FT.	JARS	SACKS	SPLIT SPOON	SHELBY TUBE	MOISTURE CONTENT	PENETRATION RESISTANCE BLOWS/FT.
GRAVEL, silty, some cobbles, damp	brown	dense	GM-GP							
				1						
				2						
				3						
				4						
				5						
				6						
increasing amount of large cobbles				7						
				8						
				9						
				10					15	50+
very loose cobbles, difficult drilling				11	×					
				12						
				13						
losing circulation				14						
Bottom of Boring = 15.0 Feet				15						
				16						
				17						
				18						
NOTE: unable to advance hole deeper; casing could not be driven through cobbles, also lost all drilling mud.				19						
				20						

LOWNEY·KALDVEER ASSOCIATES

Foundation / Soil / Geological Engineers

PALO ALTO, CALIFORNIA

GUADALUPE CREEK
San Jose, California

EXPLORATORY BORING LOG

PROJECT NO.	DATE	SHEET NO.	BORING NO.
109-4	March 1971	1 OF 1	1

DRILL RIG Rotary Wash	BORING ELEVATION ---	LOGGED BY J. C. W.
DEPTH TO GROUNDWATER As Noted	BORING DIAMETER 6 Inches	DATE DRILLED 2/26/71

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH FT.	JARS	SACKS	SPLIT SPOON	SHELBY TUBE	MOISTURE CONTENT	PENETRATION RESISTANCE BLOWS/FT.
GRAVEL, silty, locally clayey, lenses of large gravel and cobbles locally present	brown to dark brown	dense	GM-GP	1						
				2						
				3						
				4						
				5						
				6					▽	
large cobbles, to 6" diameter				7						
				8						
				9						
		very dense		10						
				11	x				10	50+
				12						
large cobbles, loose, difficult to advance hole				13						
				14						
				15						
				16						
GRAVEL, clayey, particles less less than 1" diameter, matrix somewhat plastic	tan to light brown			17						
				18					14	75
				19	x					
Bottom of Boring = 19.5 Feet				20						

LOWNEY·KALDVEER ASSOCIATES
Foundation / Soil / Geological Engineers
PALO ALTO, CALIFORNIA

GUADALUPE CREEK
San Jose, California

EXPLORATORY BORING LOG

PROJECT NO.	DATE	SHEET NO.	BORING NO.
109-4	March 1971	1 OF 1	2

DRILL RIG Rotary Wash	BORING ELEVATION ---	LOGGED BY J. C. W.
DEPTH TO GROUNDWATER Not Determined	BORING DIAMETER 6 . Inches	DATE DRILLED 2/26/71

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH FT.	JARS	SACKS	SPLIT SPOON	SHELBY TUBE	MOISTURE CONTENT	PENETRATION RESISTANCE BLOWS/FT.
GRAVEL, silty, local lenses of large gravel and cobbles	brown	dense	GM-GP	1						
				2						
				3						
				4						
				5						
				6						
increasing amount of cobbles, caving, difficult drilling				7						
				8						
				9						
				10					5	47
				11	x					
				12						
				13						
				14						
increasing amount of clay				15						
GRAVEL, clayey, some cobbles, smooth but slow advance of hole	tan to brown	very dense	GC	16						
				17						
				18					10	62
				19	x					
Bottom of Boring = 19.5 Feet				20						

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PALO ALTO, CALIFORNIA

GUADALUPE CREEK
San Jose, California

EXPLORATORY BORING LOG

PROJECT NO.	DATE	SHEET NO.	BORING NO.
109-4	March 1971	1 OF 1	3

DRILL RIG Rotary Wash	BORING ELEVATION ---	LOGGED BY J. C. W.
DEPTH TO GROUNDWATER As Noted	BORING DIAMETER 6 Inches	DATE DRILLED 2/26/71

DESCRIPTION AND CLASSIFICATION: DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH FT.	JARS	SACKS	SPLIT SPOON	SHELBY TUBE	MOISTURE CONTENT	PENETRATION RESISTANCE BLOWS/FT.
GRAVEL, silty, some lenses of poorly graded large gravel 2 to 3" in diameter, locally clayey	brown	dense to very dense	GM-GP	1						
				2						
				3						
				4						
lens of cobbles, caving interval				5						
				6						
				7						
				8						
increasing amount of clay as film on larger gravel	light brown			9					▽	
				10			I		5	72
				11	x		I			
				12						
				13						
losing mud circulation, caving interval				14						
				15						
GRAVEL, clayey, matrix somewhat plastic, particles well rounded, up to 1" in diameter	tan to dark brown	very dense	GC	16						
				17						
				18			I		16	90
				19	x		I			
Bottom of Boring = 19.5 Feet				20						

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DRILL RIG Rotary Wash	BORING ELEVATION ---	LOGGED BY J. C. W.
DEPTH TO GROUNDWATER Not Determined	BORING DIAMETER 6 Inches	DATE DRILLED 2/25/71

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH FT.	JARS	SACKS	SPLIT SPOON	SHELBY TUBE	MOISTURE CONTENT	PENETRATION RESISTANCE BLOWS/FT.
GRAVEL, silty, with some cobbles	brown	dense to very dense	GM							
				1						
				2						
				3						
				4						
very loose caving interval				5						
				6						
				7						
				8						
				9						
GRAVEL, silty, with some clay matrix, particles 2" to 3" in diameter, some cobbles	tan to yellow	very dense	GM-GC	10					10	55
				11	x					
				12						
				13						
				14						
				15						
caving interval, loose gravel and cobbles				16						
				17					11	73
increasing clay matrix				18	x					
Bottom of Boring= 18.5 Feet				19						
				20						

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PALO ALTO, CALIFORNIA

GUADALUPE CREEK
San Jose, California

EXPLORATORY BORING LOG

PROJECT NO.	DATE	SHEET NO.	BORING NO.
109-4	March 1971	1 OF 1	5

DRILL RIG Rotary Wash	BORING ELEVATION ---	LOGGED BY J. C. W.
DEPTH TO GROUNDWATER As Noted	BORING DIAMETER 6 Inches	DATE DRILLED 2/25/71

DESCRIPTION AND CLASSIFICATION										
DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH FT.	JARS	SACKS	SPLIT SPOON	SHELBY TUBE	MOISTURE CONTENT	PENETRATION RESISTANCE BLOWS/FT.
GRAVEL, silty, with some sand and local clay matrix	brown	dense	GM	0						
				10					▽	
slight increase in clay matrix, local cobbles, caving interval, losing drilling mud				11						
				14			▯		11	34
				15.5	×					
increasing amount of cobbles, very loose and caving losing drilling mud at total depth				17						
Bottom of Boring = 20.0 Feet				20						

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GUADALUPE CREEK
San Jose, California

EXPLORATORY BORING LOG

PROJECT NO.	DATE	SHEET NO.	BORING NO.
109-4	March 1971	1 OF 1	6

DRILL RIG Rotary Wash	BORING ELEVATION 193	LOGGED BY K.P.
DEPTH TO GROUNDWATER As Noted	BORING DIAMETER 6 Inches	DATE DRILLED 2/25/71

DESCRIPTION AND CLASSIFICATION										
DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH FT.	JARS	SACKS	SPLIT SPOON	SHELBY TUBE	MOISTURE CONTENT	PENETRATION RESISTANCE BLOWS/FT.
GRAVEL, sandy and silty, with some clay matrix, maximum diameter of particles 2"	brown		GC-GM	1						
				2						
				3						
				4						
				5			▯		6	50+
				6	X					
				7						
				8						
				9					∇	
				10						
				11						
				12						
				13						
				14						
				15						
				16						
				17						
				18						
				19						
				20						
Bottom of Boring = 20.0 Feet										

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GUADALUPE CREEK
San Jose, California

EXPLORATORY BORING LOG

PROJECT NO.	DATE	SHEET NO.	BORING NO.
109-4	March 1971	1 OF 1	7

DRILL RIG Rotary Wash	BORING ELEVATION	LOGGED BY K.P.
DEPTH TO GROUNDWATER As Noted	BORING DIAMETER 6 Inches	DATE DRILLED 2/25/71

DESCRIPTION AND CLASSIFICATION DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH FT.	JARS	SACKS	SPLIT SPOON	SHELBY TUBE	MOISTURE CONTENT	PENETRATION RESISTANCE BLOWS/FT.
GRAVEL, sandy and silty, with small amounts of clay, diameter of particles 1 to 2 inches	brown	dense	GM-GW	1						
				2						
				3						
locally grading to clean, well graded sand and gravel with increasing depth				4						
				5						
				6					▽	
				7						
				8						
				9						
				10						
				11						
local clay matrix			GM-GC	12			☐		10	73
				13			☐			
				14						
				15						
				16						
				17						
				18						
				19						
				20						
Bottom of Boring = 20.0 Feet										

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San Jose, California

EXPLORATORY BORING LOG

PROJECT NO.	DATE	SHEET NO.	BORING NO.
109-4	March 1971	1 OF 1	8

APPENDIX B - LABORATORY INVESTIGATION

The laboratory testing program was directed toward a quantitative and qualitative evaluation of the physical and mechanical properties of the natural materials within potential borrow areas.

The natural water content was determined on all samples and is recorded on the exploratory boring logs at the appropriate depths. Since water has a significant influence on soil, the natural water content provides a rough indicator of the soil's compressibility and strength.

Two laboratory compaction curves were made on typical granular soils in accordance with California Test Method 216. The purpose of these tests was to establish the maximum dry densities for these materials in order that the relative compaction of the in-place native soils could be evaluated, and to assist in estimating shrinkage of the material when used as fill. In conjunction with this, a total of 16 field density tests were taken in four test pits along the alignment in order to establish the in-place density. The field density tests were taken in accordance with the sand-cone method, ASTM Test Designation D 1556-64. The results of both the compaction curves and the density tests are presented on Tables B-1 and B-2.

A sieve analysis was also made of typical granular soil to determine the gradation (Figure B-1).

GRADATION TEST RESULTS

Hole No.

Tested By K.P.

Area

Appr. By

Date 3/71

Job No. 109-4

File No.

Fig No. B-1

LL									
PL									
PI									
NAT. W/C									
CLASSIF. SYMB.									
SAMPLE NO.	1								
DEPTH FT.	12								
HOLE NO.									

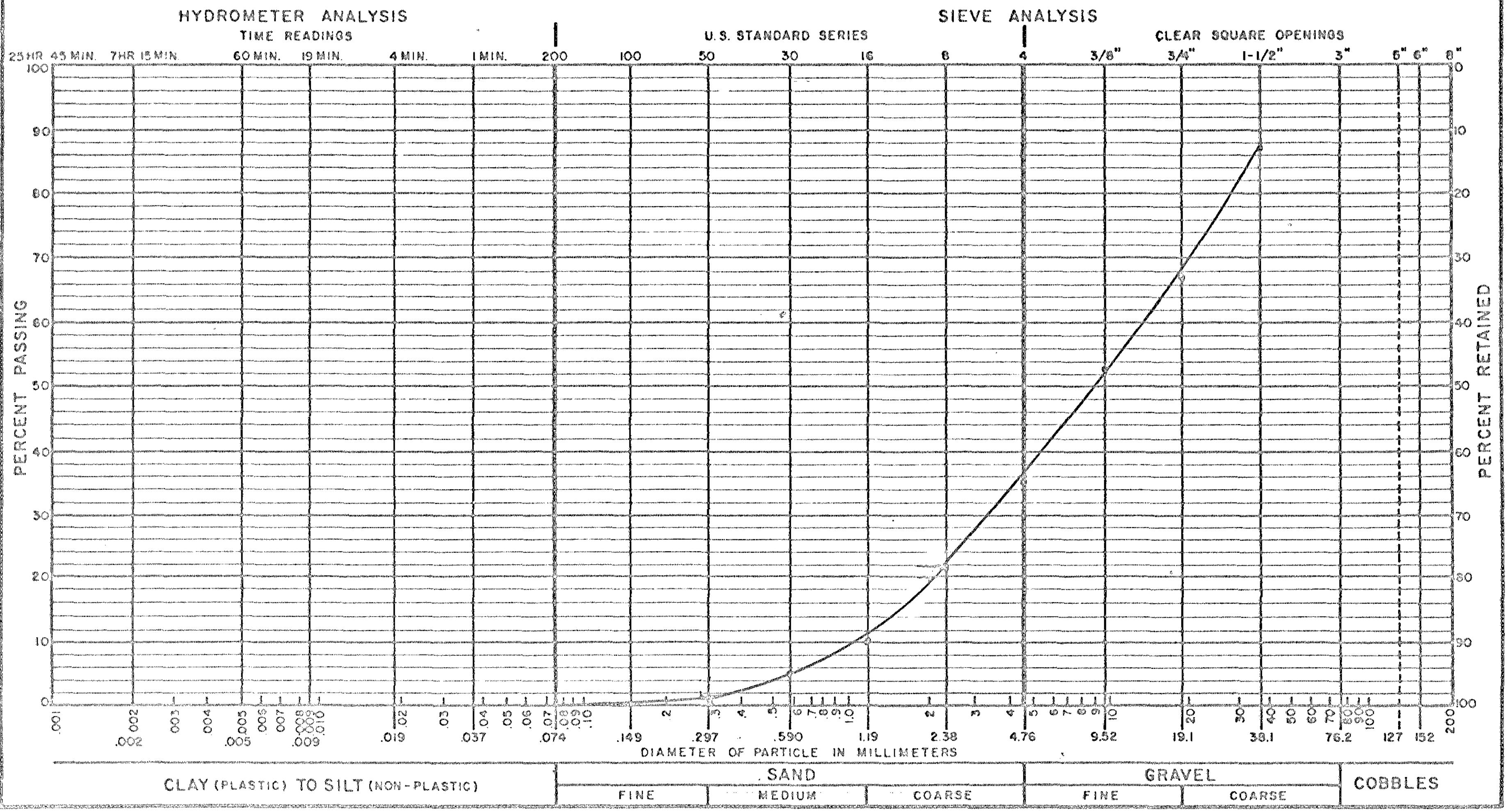

TABLE B - 1, SHRINKAGE DETERMINATION

(Assuming 92 Percent Compaction)

Pit & Test No.	Depth (Feet)	In-Place Dry Density (pcf)	92% Maximum Dry Density	Shrinkage (%)	Swell (%)
SANDY GRAVEL					
1-1	8	118.0	126.3	6.8	
1-2	9	107.1	126.3	15.3	
1-3	10	119.5	126.3	5.7	
1-4	11	130.3	126.3	-	3.0
1-5	12	116.5	126.3	7.8	
1-6	13	131.2	126.3	--	3.8
2-1	12	123.0	126.3	2.8	
2-2	12	116.0	126.3	8.4	
2-3	11	116.3	126.3	8.0	
2-4	10	114.9	126.3	9.2	
3-1*	8	115.0	126.3	9.1	
3-2*	9	128.5	126.3	--	1.5
3-3*	9	114.0	126.3	10.0	
4-1*	5	115.7	126.3	8.7	
SANDY, SILTY GRAVEL					
4-2*	4	101.5	131.0	22.5	
4-3*	3	128.0	131.0	2.3	

TABLE B - 2, COMPACTION TEST RESULTS

(California Test Method 216)

MATERIAL	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
Sandy GRAVEL	137.3	5.4
Sandy, Silty GRAVEL	142.4	9.8

* Large Volume Test